IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
Before the Board of Patent Appeals and Interferences

In re Patent Application of
O'BRIEN et al
Serial No. 09/043,406
Filed: March 18, 1998
Title: SERVICE PROVISION SYSTEM FOR USE IN DISTRIBUTED PROCESSING ENVIRONMENTS

Atty Dkt. RYM-36-1148
C# M#
TC/A.U.: 3628
Examiner: Robinson Boyce, A.
Date: September 26, 2007

Mail Stop Appeal Brief - Patents
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

☒ **Correspondence Address Indication Form Attached.**

☐ **NOTICE OF APPEAL**
Applicant hereby **appeals** to the Board of Patent Appeals and Interferences from the last decision of the Examiner twice/finally rejecting applicant's claim(s). $500.00 (1401)/$250.00 (2401) $

☒ An appeal **BRIEF** is attached in the pending appeal of the above-identified application $500.00 (1402)/$250.00 (2402) $ 500.00

☒ Credit for fees paid in prior appeal without decision on merits -$ (500.00)

☐ A reply brief is attached. **(no fee)**

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Any future submission requiring an extension of time is hereby stated to include a petition for such time extension. The Commissioner is hereby authorized to charge any deficiency, or credit any overpayment, in the fee(s) filed, or asserted to be filed, or which should have been filed herewith (or with any paper hereafter filed in this application by this firm) to our **Account No. 14-1140.** A duplicate copy of this sheet is attached.

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

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O'BRIEN et al — Atty. Ref.: 36-1148

Serial No. 09/043,406 — TC/A.U.: 3628

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For: SERVICE PROVISION SYSTEM FOR USE IN DISTRIBUTED PROCESSING ENVIRONMENTS

* *

September 26, 2007

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APPEAL BRIEF

Sir:

Appellant hereby **appeals** to the Board of Patent Appeals and Interferences from the last decision of the Examiner.

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(I) REAL PARTY IN INTEREST

The real party in interest is British Telecommunications public limited company, a corporation of the country of England.

(II) RELATED APPEALS AND INTERFERENCES

The appellant, the undersigned, and the assignee are not aware of any related appeals, interferences, or judicial proceedings (past or present), which will directly affect or be directly affected by or have a bearing on the Board's decision in this appeal.

(III) STATUS OF CLAIMS

Claims 53-57 and 61-67 are pending. Claims 53-57 and 61-66 have been rejected. The rejections of claims 53-57 and 61-66 are being appealed. Claims 1-52, 58-60 and 68-76 have been canceled. No claims have been substantively allowed, although it appears that claim 67 has not been specifically identified as being rejected.

(IV) STATUS OF AMENDMENTS

No amendments have been filed since the date of the Final Rejection.

(V) SUMMARY OF CLAIMED SUBJECT MATTER

A listing of each independent claim, each dependent claim argued separately and each claim having means plus function language is provided below including exemplary, but not limiting, reference(s) to reference numerals and page and line number(s) of the specification.

53. A distributed computer [Fig. 1; pg. 10, ll. 22-31] programmed to provide a multi-agent system [Fig. 1; pg. 3, ll. 11-16; pg. 10, ll. 22-26] having a plurality of interoperating agents [50 in Fig. 5; 10 in Figs. 1 and 8; pg. 10, l. 32 – pg. 11, l. 5; pg. 12, ll. 13-18], each agent comprising:

an input [56 in Figs. 5 and 8] for receiving a service request for a composite service [pg. 7, ll. 7-14]; [pg. 3, ll. 14-18]

processing means [pg. 2, l. 32 – pg. 3, l. 2; pg. 2, ll. 12-13] for processing the composite service request; [pg. 12, ll. 23-26]

negotiation means [51 in Figs. 5 and 8; pg. 15, ll. 25-27; pg. 16; ll. 11-32] for use in establishing conditions [SLAs; pg. 3, ll. 18-22] applicable to provision, by one or more other agents in said multi-agent system, of one or more component processes involved in provision of the composite service, said negotiation means [51] being adapted to assemble said conditions proactively by negotiation prior to receipt of said composite service request; [pg. 15, ll. 3-7; pg. 16, l. 22 to pg. 17, l. 2]

an up-datable data store [54, 55 in Figs. 5 and 8; pg. 12, ll. 19-22; 59 in Fig. 8];

means to access [pg. 2, ll. 16-18; pg. 11, ll. 1-5; pg. 12, ll. 19-22] said up-datable data store [54, 55, 59] for storing said conditions [SLAs] when established and assembled; and

an output [56 in Figs. 5 and 8] for providing a response to the composite service request, said response comprising an indication of availability of the requested composite service; [pg. 3, ll. 14-18; pg. 11, ll. 3-5; pg. 20, ll. 1-4]

wherein the processing means [pg. 2, l. 32 – pg. 3, l. 2; pg. 2, ll. 12-13] is adapted to process a composite service request by accessing one or more of the previously established conditions [SLAs], for supply of component processes by said one or more other agents, in the data store, processing the request using the one or more established conditions [SLAs] and producing said response. [pg. 2, ll. 22-24; pg. 10, l. 32 to pg. 11, l. 5; pg. 12, ll. 23-26; pg. 13, ll. 1-5; pg. 17, ll. 11-28]

54. A distributed computer as in claim 53 wherein one or more of said established conditions [SLAs] has an associated expiry time after which it is no longer applicable [pg. 4, ll. 6-14; pg. 17, ll. 3-10; pg. 19, ll. 7-13; pg. 23, ll. 6-14].

55. A distributed computer as in claim 54 wherein the processing means is adapted to detect an expired or undefined condition [SLA] in the data store, which condition is applicable to a component process used in the provision of the requested composite service, and to trigger the negotiation means to establish a substitute condition. [pg. 7, ll. 15-21; pg. 4, ll. 1-5; pg. 28, ll. 21-28; pg. 17, l. 15 – pg. 18, l. 7]

56. A distributed computer as in claim 55 further comprising:

means to access said data store [54, 58, 59] for storing data related to services offered by the agent and to one or more entities which have an interest in receiving information relating to one or more of said services, together with means [56] to transmit information based on said data related to services to the one or more entities which have an interest. [pg. 5, ll. 3-17; pg. 6, ll. 12-14; pg. 7, ll. 15-24; pg. 11, ll. 1-5; pg. 20, ll. 1-4]

57. A distributed computer as in claim 53 which further comprises initiation means [57 in Fig. 5] to initiate one or more component processes in provision of a requested composite service. [pg. 20, ll. 5-10]

61. A method of operating a distributed computer [Fig. 1; pg. 10, ll. 20-31] to provide a multi-agent system [Fig. 1; pg. 3, ll. 11-16; pg. 10, ll. 22-26], said method involving each agent [50 in Fig. 5; 10 in Figs. 1 and 8; pg. 10, l. 32 – pg. 11, l. 5; pg. 12, ll. 13-18]:

establishing conditions [SLAs] applicable to provision, by one or more other agents in said multi-agent system, of one or more component processes in a composite service, proactively by negotiation prior to receipt of a request for said composite service; [pg. 15, ll. 3-8 and 25-27; pg. 16, l. 22 to pg. 17, l. 2]

accessing an up-datable data store [54, 55 in Figs. 5 and 8; 59 in Fig. 8; pg. 12, ll. 19-22] and storing said component process supply conditions [SLAs] once established; [pg. 11, ll. 1-5; pg. 72, ll. 19-22]

subsequently receiving a request for said composite service; [pg. 2, l. 11; pg. 10, l. 32 to pg. 11, l. 1; pg. 15, ll. 5-7; pg. 20, ll. 1-4]

processing said composite service request by: [pg. 2, ll. 12-13]

a) accessing one or more of said previously established conditions [SLAs], for component process supply in the data store [54, 55, 59]; and [pg. 2, ll. 16-18; pg. 11, ll. 1-5; pg. 12, l. 19-22]

b) providing a response to the composite service request, said response comprising an indication of availability of the requested composite service dependent upon whether said one or more established conditions for component process supply is met. [pg. 2, ll. 27-31; pg. 10, l. 32 to pg. 11, l. 5; pg. 12, ll. 23-26; pg. 13, ll. 1-5]

62. A method according to claim 61 wherein one or more of said established conditions [SLAs] for the component process supply stored in said data store is applicable until advent of an expiry time associated with said one or more conditions. [pg. 4, ll. 6-14; pg. 17, ll. 3-10; pg. 19, ll. 7-13; pg. 23, ll. 6-14]

63. A method according to claim 62 further comprising the step, responsive to receipt of said composite service request, of finding whether any conditions [SLAs] for provision of component processes in said service are expired or undefined and substituting a substitute condition in the event that any such condition is found. [pg. 7, ll. 15-21; pg. 4, ll. 1-5; pg. 28, ll. 21-28; pg. 17, l. 15 – pg. 18, l. 7]

64. A method according to claim 61 wherein said method further comprises the step of scheduling provision of said one or more component processes, said step being carried out after receipt of said request for said composite service. [pg. 5, ll. 3-17; pg. 6, ll. 12-14; pg. 7, ll. 15-24; pg. 11, ll.1-5; pg. 17, ll. 11-18]

65. A method according to claim 64 wherein said method further comprises the step, responsive to a failure to schedule one or more component processes, of carrying out one of the following steps: [pg. 7, ll. 15-18]

i) re-schedule the component process; [pg. 7, l. 19]

ii) transmit a message to an entity which requested the composite service indicating that the composite service can only be provided under conditions different to previously established conditions for supply of said composite service; [pg. 7, l. 20-21]

iii) re-assign the composite service to another service provider; or [pg. 7, l. 22]

iv) indicate to an entity which requested the composite service that the requested composite service cannot be provided. [pg. 7, l. 23]

66. A method according to claim 61 further comprising the step of identifying component processes for use in provisioning the requested composite service. [pg. 2, ll. 12-13; pg. 2, l. 32 to pg. 3, l. 2; pg. 14, ll. 25-33]

67. A method according to claim 66 which further comprises initiating one or more of said component processes identified for use in the requested composite service. [57 in Fig. 5, pg. 20, ll. 5-9]

(VI) GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

Whether claims 53-57 and 61-66[1] are "obvious" under 35 U.S.C. §103 over Carr et al. (U.S. Patent No. 5,608,446).

[1] Claim 67 was not identified as being among the rejected claims in the first sentence of Section 3 (pg. 2) of the final rejection.

(VII) ARGUMENT

Claims 53-58 and 61-66[2] are not obvious under 35 U.S.C. §103 over Carr et al (U.S. '446, hereinafter "Carr").

In order to establish a *prima facie* case of obviousness, all of the claim limitations must be taught or suggested by the prior art. Carr fails to teach or suggest all of the claim limitations. For example, Carr fails to teach or suggest processing a service request for a composite service on the basis of one or more pre-negotiated conditions with one or more providers of sub-services (i.e., sub-processes) included within the composite service. Namely, Carr fails to teach or suggest "processing means for processing the composite service request; negotiation means for use in establishing conditions applicable to provision, by one or more other agents in said multi-agent system, of one or more component processes involved in provision of the composite service, said negotiation means being adapted to assemble said conditions proactively by **negotiation prior to receipt of said composite service request**...wherein the processing means is adapted to process a composite service request by accessing one or more of the previously established conditions, for supply of component processes by said one or more other agents, in the data store, processing the request using the one or more established conditions and producing said response (emphasis added)," as required by independent claim 53. Carr also fails to teach or suggest "establishing conditions applicable to provision, by one or more other agents in said multi-agent system, of one or more component processes in a composite service, proactively by **negotiation prior to receipt of a request for said composite service**...processing said composite service request by: a) accessing said previously established conditions, for component process supply in the data store (emphasis added)," as required by independent claim 61.

[2] Claim 67 was not identified as being among the rejected claims in the first sentence of Section 3 (pg. 2) of the final rejection.

Rather than assembling conditions proactively by negotiation prior to receipt of a composite service request as claimed, the negotiation in Carr takes place in response to a service request. That is, the negotiation in Carr takes place after receipt of the service request. This activity in response to the service request in Carr slows the response time down because the negotiation takes time. In contrast, negotiation has taken place before a composite service request in the present invention. This pre-negotiation in the present invention speeds-up the response to the service request.

Section 5 (pages 8-9) of the Final Rejection alleges that col. 9, line 60 to col. 10, line 9 of Carr teaches negotiation prior to receipt of a composite service request as claimed. Appellant respectfully disagrees. Col. 9, line 60 to col. 10, line 9 of Carr states the following:

> Upon making a determination that a substantial quantity of data is to be transmitted to a given user, the service provider could then **initiate** a request for bandwidth allocation on the cable TV system which would be transmitted by router 42 to control processor 48 which could then assigned (sic -- assign) a specified bandwidth for a given period of time in order to accommodate the data to be transmitted from the service provider to the user. This type of system requires the cooperative interaction between enhanced service provider and the split channel bridging unit in order to allocate bandwidth and provide for efficient data transmission through the cable television network where appropriate. Such an alternative system has the disadvantage that additional overhead and packet transmissions are required in order to provide the negotiations between the split channel bridging unit 18 and each enhanced service provider in order assign and allocate bandwidth. (Emphasis added.)

The above passage of Carr clearly and unambiguously states that the negotiations between the split channel bridging unit 18 (in particular, the control processor 48 of the split channel bridging unit 18) and an enhanced service provider 10A-10N occurs after a request for bandwidth allocation initiated by the enhanced service provider 10A-10N is transmitted to and received by the split channel bridging unit 18 (and certainly after a request for information has been made by and received from a user). That is, the above passage of Carr clearly and

unambiguously indicates that the enhanced service provider 10A-10N initiates and transmits a request for bandwidth allocation. This request for bandwidth allocation is received by the split channel bridging unit 18 (in particular, received by the control processor 48 of the split channel bridging unit 18), which thereafter assigns a specific bandwidth for a given period of time to accommodate data to be transmitted from the service provider to the user. The "cooperative interaction" between the enhanced service provider 10A-10N and the split channel bridging unit 18 (including control processor 48) in order to allocate bandwidth occurs after the split channel bridging unit 18 has received the request for bandwidth allocation from the enhanced service provider 10A-10N.

Appellant submits that the control processor 48 of the split channel bridging unit 18 knows how much data has to be transmitted (e.g., 8 Mbits), knows how much bandwidth can be provided to the user on a selected RF channel (e.g., 2 $Mbits^{-1}$) and allocates the enhanced service provider 2 $Mbits^{-1}$ ("a specified bandwidth" in the above passage) for 4 seconds ("a given period of time" in the above passage). The control processor 48 of the split channel bridging unit therefore finds the available bandwidth, specifies how much is available and indicates to the enhanced service provider 10A-10N how much is available. The control processor 48 cannot specify how much bandwidth is available before receipt of the service request from the enhanced service provider 10A-10N, because the amount of bandwidth available varies over time (depending on how many users are at any given moment downloading data from the enhanced service provider), and it has no way of knowing in advance when the data request will arrive (as users are inherently unpredictable).

Accordingly, the negotiation specifically identified in col. 10, lines 5-9 of Carr involves the enhanced service provider 10A-10N initiating and transmitting a request for bandwidth to the split channel bridging unit 18, and then the split channel bridging unit 18 then telling the enhanced service provider 10A-10N what bandwidth has been allocated (in other words,

specifying the bandwidth) for the transmission and for how long the allocation will last. The determination of the bandwidth allocation and how long the allocation will last by the split channel bridging unit 18 is performed after receipt of the request for bandwidth allocation received from the enhanced service provider 10A-10N which initiates and transmits that request. This determination is not performed before receipt of the request for at least the reasons discussed above.

The Final Rejection's allegation that "the negotiation must take place before the request for bandwidth allocation" (see page 9) is therefore erroneous. The negotiation process between the split channel bridging unit 18 and the enhanced service provider 10A-10N to assign and allocate bandwidth is performed as a result of (i.e., after) the request for bandwidth allocation is initiated and transmitted by the enhanced service provider 10A-10N and received by the split channel bridging unit 18. Cooperative interaction forming the negotiation between the split channel bridging unit 18 and the enhanced service provider 10A-10N occurs as a result of, and hence after, initiation, transmission and receipt of the request for bandwidth allocation. The control processor 48 of split channel bridging unit 18 assigns a specified bandwidth for a given period of time after receipt by the split channel bridging unit 18 of the request for bandwidth allocation from the enhanced service provider 10-10N.

Moreover, the request for bandwidth in Carr is an example of a request for an atomic (individual) service being dealt with by reference to some resource availability data. It is unknown how this request to allocate bandwidth can be reasonably construed to teach or suggest a composite service request, one or more component processes being involved in the provision of the composite service as claimed.

Even further, Section 5 (page 8) of the Office Action alleges that "As shown in col. 10, lines 31-36, there is a plurality of 6 megahertz bandwidth RF channels to be concurrently available. Therefore the request can be allowed based on 6 different bandwidths, and in order to

make an allocation one out of the 6 bandwidths must be negotiation for each request (emphasis added)." Appellant fails to understand this allegation. In particular, Appellant fails to understand the meaning of the expression "one of the 6 bandwidths." It appears that this allegation expresses a misunderstanding of Carr. The appropriate understanding of this portion of Carr can be developed from the following discussion.

Carr repeatedly refers to RF (Radio Frequency) channels. Carr indicates that the channels are 6 Mhz. (See, e.g., col. 3, lines 42-43 of Carr.) This is typical for a U.S. cable television system as evident from the attached pages from Wikipedia and Howstuffworks.com attached in Section (IX) Evidence Appendix of this Appeal Brief, which describe that each of the channels is 6 Mhz. Some of those channels carry TV programs, other channels carry data. It is up to the cable network operator which physical channel carries which TV program. A cable network carries a number of such channels simultaneously (which is trivial since they occupy different frequency bands as the Wikipedia excerpt shows). The head-end of the cable network multiplexes the different channels onto the cable company's cable which winds its way around the local neighborhood in which cable customers tap into in order to get cable television service. This is what Col. 10, lines 31-36 of Carr is discussing.

Carr suggests that one or more of the available RF channels might be a data channel shared by many users (see, e.g., col. 4, lines 59-63). Again, that is fairly typical. If the number of users receiving data from a given cable becomes too great, then it might be necessary for the cable operator to assign one or more extra channels to carry data, and to divide the data customers into groups (see col. 6, lines 7-17). A cable operator may be typically aware of the data made available via each 6 Mhz channel (although it might vary from channel to channel depending on variation in the amount of interference at different frequencies). Hence, a cable operator could maintain a database which sets out additional data rate an RF channel already transmitting data might be able to offer.

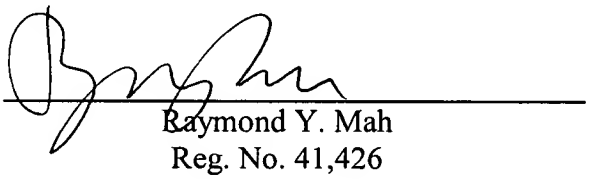
Assuming the alternative system mentioned in col. 9, line 60 to col. 10, line 9 of Carr differs from the system discussed before it only in the ways mentioned, the alternative system would merely involve the enhanced service provider 10A-10N sending the control processor 48 of the split channel bridging unit 18 an indication of how much information it wants to send the user (see col. 8, lines 65-67 for example). As discussed above, the control processor 48 of split channel bridging unit 18, in response to (i.e., after receipt of) a request for available bandwidth, sends back to the enhanced service provider a specified bandwidth for a given period of time in order to accommodate the amount of information to be transmitted to the user from the enhanced service provider 10A-10N. Again, this indication of available bandwidth cannot be made prior to receipt of the request from the enhanced service provider 10A-10N.

CONCLUSION

In conclusion it is believed that the application is in clear condition for allowance; therefore, early reversal of the Final Rejection and passage of the subject application to issue are earnestly solicited.

Respectfully submitted,

NIXON & VANDERHYE P.C.

By: 

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(VIII) CLAIMS APPENDIX

1. -52. (canceled)

53. A distributed computer programmed to provide a multi-agent system having a plurality of interoperating agents, each agent comprising:

an input for receiving a service request for a composite service;

processing means for processing the composite service request;

negotiation means for use in establishing conditions applicable to provision, by one or more other agents in said multi-agent system, of one or more component processes involved in provision of the composite service, said negotiation means being adapted to assemble said conditions proactively by negotiation prior to receipt of said composite service request;

an up-datable data store;

means to access said up-datable data store for storing said conditions when established and assembled; and

an output for providing a response to the composite service request, said response comprising an indication of availability of the requested composite service;

wherein the processing means is adapted to process a composite service request by accessing one or more of the previously established conditions, for supply of component processes by said one or more other agents, in the data store, processing the request using the one or more established conditions and producing said response.

54. A distributed computer as in claim 53 wherein one or more of said established conditions has an associated expiry time after which it is no longer applicable.

55. A distributed computer as in claim 54 wherein the processing means is adapted to detect an expired or undefined condition in the data store, which condition is applicable to a component process used in the provision of the requested composite service, and to trigger the negotiation means to establish a substitute condition.

56. A distributed computer as in claim 55 further comprising:

means to access said data store for storing data related to services offered by the agent and to one or more entities which have an interest in receiving information relating to one or more of said services, together with means to transmit information based on said data related to services to the one or more entities which have an interest.

57. A distributed computer as in claim 53 which further comprises initiation means to initiate one or more component processes in provision of a requested composite service.

58.-60. (canceled)

61. A method of operating a distributed computer to provide a multi-agent system, said method involving each agent:

establishing conditions applicable to provision, by one or more other agents in said multi-agent system, of one or more component processes in a composite service, proactively by negotiation prior to receipt of a request for said composite service;

accessing an up-datable data store and storing said component process supply conditions once established;

subsequently receiving a request for said composite service;

processing said composite service request by:

a) accessing one or more of said previously established conditions, for component process supply in the data store; and

b) providing a response to the composite service request, said response comprising an indication of availability of the requested composite service dependent upon whether said one or more established conditions for component process supply is met.

62. A method according to claim 61 wherein one or more of said established conditions for the component process supply stored in said data store is applicable until advent of an expiry time associated with said one or more conditions.

63. A method according to claim 62 further comprising the step, responsive to receipt of said composite service request, of finding whether any conditions for provision of component processes in said service are expired or undefined and substituting a substitute condition in the event that any such condition is found.

64. A method according to claim 61 wherein said method further comprises the step of scheduling provision of said one or more component processes, said step being carried out after receipt of said request for said composite service.

65. A method according to claim 64 wherein said method further comprises the step, responsive to a failure to schedule one or more component processes, of carrying out one of the following steps:

i) re-schedule the component process;

ii) transmit a message to an entity which requested the composite service indicating that the composite service can only be provided under conditions different to previously established conditions for supply of said composite service;

iii) re-assign the composite service to another service provider; or

iv) indicate to an entity which requested the composite service that the requested composite service cannot be provided.

66. A method according to claim 61 further comprising the step of identifying component processes for use in provisioning the requested composite service.

67. A method according to claim 66 which further comprises initiating one or more of said component processes identified for use in the requested composite service.

68.-76. (canceled)

(IX) EVIDENCE APPENDIX

Curt Franklin, "How Cable Television Works" from www.howstuffworks.com downloaded in 2007 and stating among other things, "In both tuning systems, each television station was given a 6-megahertz (MHz) slice of the radio spectrum." (Page 2).

"North American cable television frequencies" from http://en.wikipedia.org/wiki/North_American_cable_television_frequencies

howstuffworks
it's good to know.

Main > Electronics > **Home Theater**

How Cable Television Works

by Curt Franklin

Introduction to How Cable Television Works

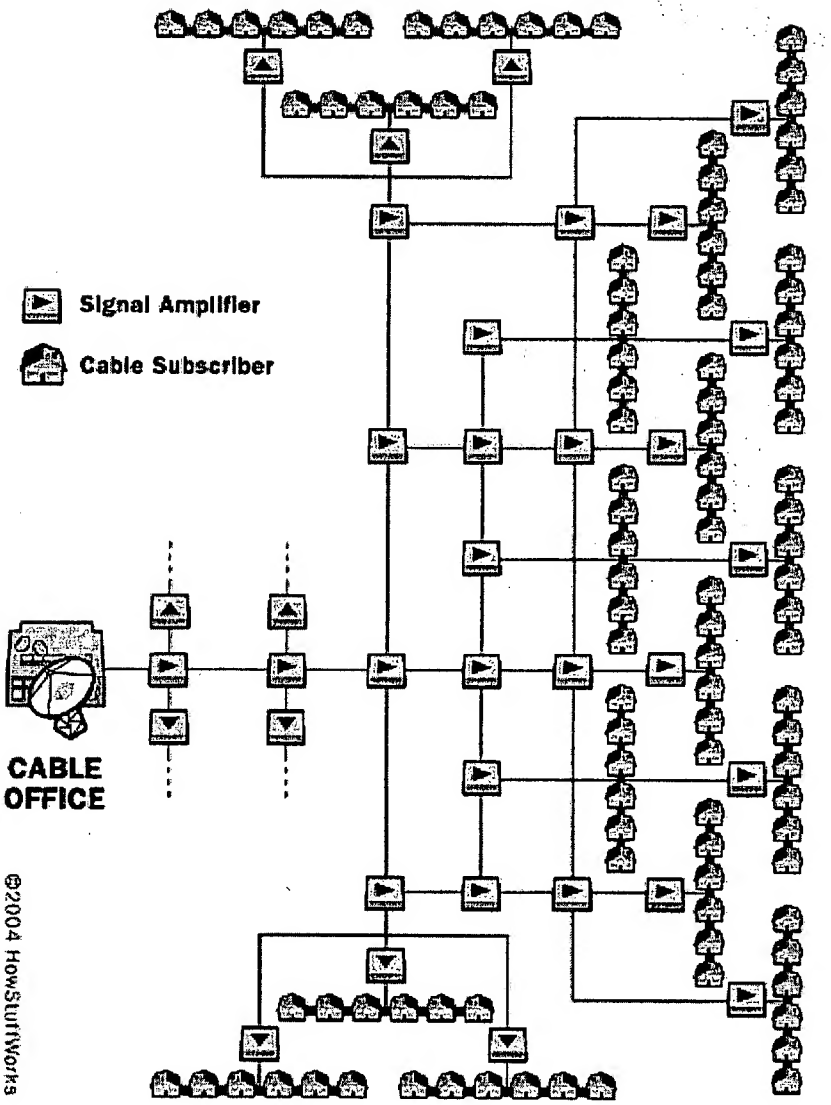
In the 1950s, there were four television networks in the United States. Because of the frequencies allotted to television, the signals could only be received in a "line of sight" from the transmitting antenna. People living in remote areas, especially remote mountainous areas, couldn't see the programs that were already becoming an important part of U.S. culture.

In 1948, people living in remote valleys in Pennsylvania solved their reception problems by putting antennas on hills and running cables to their houses. These days, the same technology once used by remote hamlets and select cities allows viewers all over the country to access a wide variety of programs and channels that meet their individual needs and desires. By the early 1990s, cable television had reached nearly half the homes in the United States.

How Cable TV Works - Have you ever wondered how your cable TV gets to your house? Watch this video from HowStuffWorks to learn more about cable TV.

Today, U.S. cable systems deliver hundreds of channels to some 60 million homes, while also providing a growing number of people with high-speed Internet access. Some cable systems even let you make telephone calls and receive new programming technologies! In this article, we'll show you how cable television brings you so much information and such a wide range of programs, from educational to inspirational to just plain odd.

The earliest cable systems were, in effect, strategically placed **antennas** with very long **cables** connecting them to subscribers' television sets. Because the signal from the antenna became weaker as it traveled through the length of cable, cable providers had to insert **amplifiers** at regular intervals to boost the strength of the signal and make it acceptable for viewing. According to Bill Wall, technical director for subscriber networks at Scientific-Atlanta, a leading maker of equipment for cable television systems, limitations in these amplifiers were a significant issue for cable system designers in the next three decades.



"In a cable system, the signal might have gone through 30 or 40 amplifiers before reaching your house, one every 1,000 feet or so," Wall says. "With each amplifier, you would get noise and distortion. Plus, if one of the amplifiers failed, you lost the picture. Cable got a reputation for not having the best quality picture and for not being reliable." In the late 1970s, cable television would find a solution to the amplifier problem. By then, they had also developed technology that allowed them to add more programming to cable service.

Adding Channels

In the early 1950s, cable systems began experimenting with ways to use microwave transmitting and receiving towers to capture the signals from distant stations. In some cases, this made television available to people who lived outside the range of standard broadcasts. In other cases, especially in the northeastern United States, it meant that cable customers might have access to several broadcast stations of the same network. For the first time, cable was used to enrich television viewing, not just make ordinary viewing possible. This started a trend that would begin to flower fully in the 1970s.

The addition of **CATV** (community antenna television) stations and the spread of cable systems ultimately led manufacturers to add a **switch** to most new television sets. People could set their televisions to tune to channels based on the Federal Communications Commission (FCC) frequency allocation plan, or they could set them for the plan used by most cable systems. The two plans differed in important ways.

In both tuning systems, each television station was given a 6-megahertz (MHz) slice of the radio spectrum. The FCC had originally devoted parts of the **very high frequency** (VHF) spectrum to 12 television channels. The channels weren't put into a single block of frequencies, but were instead broken into **two groups** to avoid interfering with existing radio services.

Later, when the growing popularity of television necessitated additional channels, the FCC allocated frequencies in the **ultra-high frequency** (UHF) portion of the spectrum. They established channels 14 to 69 using a block of frequencies between 470 MHz and 812 MHz.

Because they used cable instead of antennas, cable television systems didn't have to worry about existing services. Engineers could use the so-called mid-band, those frequencies passed over by broadcast TV due to other signals, for channels 14-22. Channels 1 through 6 are at lower frequencies and the rest are higher. The "CATV/Antenna" switch tells the television's tuner whether to tune around the mid-band or to tune straight through it.

Frequency (MHz)	Channel
54-60	2
60-66	3
66-72	4
76-82	5
82-88	6
174-180	7
180-186	8
186-192	9
192-198	10
198-204	11
204-210	12
210-216	13

While we're on the subject of tuning, it's worth considering why CATV systems don't use the same frequencies for stations broadcasting on channels 1 to 6 that those stations use to broadcast over the airwaves. Cable equipment is designed to **shield** the signals carried on the cable from outside interference, and televisions are designed to accept signals only from the point of connection to the cable or antenna; but **interference** can still enter the system, especially at connectors. When the interference comes from the same channel that's carried on the cable, there is a problem because of the difference in broadcast speed between the two signals.

Radio signals travel through the air at a speed very close to the speed of light. In a **coaxial cable** like the one that brings CATV signals to your house, radio signals travel at about two-thirds the speed of light. When the broadcast and cable signals get to the television tuner a fraction of a second apart, you see a double image called "**ghosting**."

In 1972, a cable system in Wilkes-Barre, PA, began offering the first "pay-per-view" channel. The customers would pay to watch individual movies or sporting events. They called the new service Home Box Office, or **HBO**. It continued as a regional service until 1975, when HBO began transmitting a signal to a satellite in **geosynchronous orbit** and then down to cable systems in Florida and Mississippi. Scientific-Atlanta's Bill Wall says that these early satellites could receive and retransmit up to 24 channels. The cable systems receiving the signals used dish antennas 10 meters in diameter, with a separate dish for each channel! With the beginning of satellite program delivery to cable systems, the basic architecture of the modern cable system was in place.

As the number of program options grew, the **bandwidth** of cable systems also increased. Early systems operated at 200 MHz, allowing 33 channels. As technology progressed, the bandwidth increased to 300, 400, 500 and now 550 MHz, with the number of channels increasing to 91. Two additional advances in technology -- fiber optics and analog-to-digital conversion -- improved features and broadcast quality while continuing to increase the number of channels available.

The Glass Cable

In 1976, a new sort of cable system debuted. This system used **fiber-optic cable** for the **trunk cables** that carry signals from the CATV head-end to neighborhoods. The **head-end** is where the cable system receives programming from various sources, assigns the programming to channels and retransmits it onto cables. By the late 1970s, fiber optics had progressed considerably and so were a cost-effective means of carrying CATV signals over long distances. The great advantage of fiber-optic cable is that it doesn't suffer the same signal losses as coaxial cable, which eliminated the need for so many **amplifiers**. In the early fiber-optic cable systems, the number of amplifiers between head-end and customer was reduced from 30 or 40 down to around six. In systems implemented since 1988, the number of amplifiers has been further reduced, to the point that only one or two amplifiers are required for most customers. Decreasing the number of amplifiers made dramatic improvements in signal quality and system reliability.

Another benefit that came from the move to fiber-optic cable was greater **customization**. Since a single fiber-optic cable might serve 500 households, it became possible to target individual neighborhoods for messages and services. In the 1990s, cable providers found this same neighborhood grouping to be ideal for creating a local-area network and providing Internet access through cable modems.

In 1989, **General Instruments** demonstrated that it was possible to convert an analog cable signal to digital and transmit it in a standard 6-MHz television channel. Using MPEG compression, CATV systems installed today can transmit up to 10 channels of video in the 6-MHz bandwidth of a single analog channel. When combined with a 550-MHz overall bandwidth, this allows the possibility of nearly **1,000 channels** of video on a system. In addition, digital technology allows for error correction to ensure the quality of the received signal.

The move to digital technology also changed the quality of one of cable television's most visible features: the scrambled channel.

The first system to "scramble" a channel on a cable system was demonstrated in 1971. In the first **scrambling** system, one of the signals used to synchronize the television picture was removed when the signal was transmitted, then reinserted by a small device at the customer's home. Later scrambling systems inserted a signal slightly offset from the channel's frequency to interfere with the picture, then filtered the interfering signal out of the mix at the customer's television. In both cases, the scrambled channel could generally be seen as a jagged, jumbled set of video images.

In a digital system, the signal isn't scrambled, but **encrypted**. The encrypted signal must be decoded with the proper **key**. Without the key, the digital-to-analog converter can't turn the stream of bits into anything usable by the television's tuner. When a "non-signal" is received, the cable system substitutes an advertisement or the familiar blue screen.

For more information on cable television and related topics, check out the links on the next page.

Lots More Information

Related HowStuffWorks Articles

- How Television Works
- How HDTV Works
- How Digital Television Works
- How Satellite TV Works
- How DVRs Work
- How Fiber Optics Work
- How VCRs Work
- How Cable Modems Work
- How Radio Works
- How the Radio Spectrum Works
- How do television ratings work?

More Great Links

- CATV CyberLab
- CATV Frequency Charts
- Glossary of Cable Terms
- National Cable & Telecommunications Association

North American cable television frequencies

From Wikipedia, the free encyclopedia

North America cable television broadcast band

Channel	Video Carrier (MHz)	Audio Carrier(MHz)
Subband CATV "T" Channels		
T-7	7.00	
T-8	13.00	
T-9	19.00	
T-10	25.00	
T-11	31.00	
T-12	37.00	
T-13	43.00	
T-14	49.00	
Lowband		
2	55.25	59.75
3	61.25	65.75
4	67.25	71.75
1	73.25 (A-8)	77.75 (A-8)
5	77.25 or 79.25 (A-7)	81.75 or 83.75 (A-7)
6	83.25 or 85.25 (A-6)	87.75 or 89.75 (A-6)
Midband		
95	91.25 (A-5)	95.75
96	97.25 (A-4)	101.75
97	103.25 (A-3)	107.75
98	109.25 (A-2)	113.75
99	115.25 (A-1)	119.75
Midband		
14	121.25	125.75
15	127.25	131.75
16	133.25	137.75
17	139.25	143.75
18	145.25	149.75
19	151.25	155.75
20	157.25	161.75
21	163.25	167.75
22	169.25	173.75
Highband		
7	175.25	179.75
8	181.25	185.75
9	187.25	191.75
10	193.25	197.75
11	199.25	203.75

12	205.25	209.75
13	211.25	215.75
Superband		
23	217.25	221.75
24	223.25	227.75
25	229.25	233.75
26	235.25	239.75
27	241.25	245.75
28	247.25	251.75
29	253.25	257.75
30	259.25	263.75
31	265.25	269.75
32	271.25	275.75
33	277.25	281.75
34	283.25	287.75
35	289.25	293.75
36	295.25	299.75
Hyperband		
37	301.25	305.75
38	307.25	311.75
39	313.25	317.75
40	319.25	323.75
41	325.25	329.75
42	331.25	335.75
43	337.25	341.75
44	343.25	347.75
45	349.25	353.75
46	355.25	359.75
47	361.25	365.75
48	367.25	371.75
49	373.25	377.75
50	379.25	383.75
51	385.25	389.75
52	391.25	395.75
53	397.25	401.75
54	403.25	407.75
55	409.25	413.75
56	415.25	419.75
57	421.25	425.75
58	427.25	431.75
59	433.25	437.75
60	439.25	443.75
61	445.25	449.75
62	451.25	455.75
63	457.25	461.75

64	463.25	467.75
Ultraband		
65	469.25	473.75
66	475.25	479.75
67	481.25	485.75
68	487.25	491.75
69	493.25	497.75
70	499.25	503.75
71	505.25	509.75
72	511.25	515.75
73	517.25	521.75
74	523.25	527.75
75	529.25	533.75
76	535.25	539.75
77	541.25	545.75
78	547.25	551.75
79	553.25	557.75
80	559.25	563.75
81	565.25	569.75
82	571.25	575.75
83	577.25	581.75
84	583.25	587.75
85	589.25	593.75
86	595.25	599.75
87	601.25	605.75
88	607.25	611.75
89	613.25	617.75
90	619.25	623.75
91	625.25	629.75
92	631.25	635.75
93	637.25	641.75
94	643.25	647.75
Jumboband		
100	649.25	653.75
101	655.25	659.75
102	661.25	665.75
103	667.25	671.75
104	673.25	677.75
105	679.25	683.75
106	685.25	689.75
107	691.25	695.75
108	697.25	701.75
118	757.25	761.75
128	817.25	821.75
138	877.25	881.75

148	937.25	941.75
158	997.25	1001.75

- Channels T-7 through T-14 are sub-band channels and are not used for normal television channel distribution. These channels are used for sending video back to the cable television headend, such as by public-access television stations on a cable tv system. They are also used by cable modems for sending upstream data to the headend's CMTS.
- Cable channels 2 through 13 operate on the same frequencies as broadcast television (the VHF band).
- Channels 100 to 125 can be used by analog cable systems, but frequency allocation is often inconsistent and not all televisions and VCRs can pick them up.
- Digital cable channels are often numbered starting at 100 or 200, but these are virtual channel numbers and do not correspond to used frequencies.

External links

- ARRL (http://www.arrl.org/tis/info/catv-ch.html) - TV Channel, CATV and FM Broadcast Frequencies by Kevin K. Custer (W3KKC)

See also

- North American broadcast television frequencies

Retrieved from "http://en.wikipedia.org/wiki/North_American_cable_television_frequencies"

Category: Bandplans

(X) RELATED PROCEEDINGS APPENDIX

None